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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/521,086 | 01/09/2006 | Frederick Marcel Van Der Vliet | GEML 4793-3 US | 4507 |

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| EXAMINER | |
|---|---|
| ANDERSON, GUY G | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2883 | |

DATE MAILED: 05/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H·A

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/521,086 | VAN DER VLIET, FREDERICK MARCEL | |
| | Examiner | Art Unit | |
| | Guy G. Anderson | 2883 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *January 9, 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☒ Claim(s) *5* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *January 13, 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *January 9, 2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

### *Objections*

1.1 The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "silica cores 32". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

1.2 The disclosure is objected to because of the following informalities:

a) Disclosure indicates "a 1x2^n splitter such as shown in Fig. 2" whereas Fig. 3 actually depicts a 1x2^n.

b) Element 31 is used to describe more than one element, an oxide layer and a lower silica-cladding layer.

c) The disclosure refers to a PLC chip as either element 18 or element 40 but is unclear as to what figure number the disclosure is referring to when making reference to said PLC chip.

The following is a quote from 37 C.F.R. 1.84(p)(4):

*The same part of an invention appearing in more than one view of the drawing must always be designated by the same reference character, and the same reference character must never be used to designate different parts.*

Appropriate correction is required.

1.3 **Claim 5** is objected to because of the use of the term "substantially". Substantially is an ambiguous term and fails to define or limit the following term "symmetrical".

### *Claim Rejections Under 35 U.S.C. 103(a)*

2.1 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

*(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.*

2.2 **Claims 1-8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bouda in US-6643432 in combination with Laurent-Lund in US-2005/0207705.

2.3 **Regarding Claim 1**, Bouda specifically discloses a splitter comprising:

a) a substantially single-mode input waveguide (Fig.1, Col. 4, Lines 30-50);

b) at least two Output waveguides (Fig.1, Col. 4, Lines 30-50);

c) a non-adiabatic tapered waveguide optically coupled between the input waveguide and the output waveguides (Fig.1, Col. 4, Lines 30-50);

d) said waveguides being formed on a substrate (Fig. 5);

e) wherein the non-adiabatic tapered waveguide, along at least a portion of its length;

widens in width towards the output waveguides, in a plane parallel to the substrate (Fig.1, Col. 4, Lines 30-50 and Fig.5).

Bouda does not specifically disclose a splitter wherein:

a) the non-adiabatic tapered waveguide merges substantially continuously with the input waveguide in a direction parallel to the optical axis of the input waveguide.

However, this limitation is taught by Laurent-Lund (Fig.10 and Paragraph 81). Therefore, it would have been obvious to one who was skilled in the art at the time of invention to combine the non-adiabatic tapered waveguide of Bouda with the non-linear waveguide of Laurent-Lund in order to provide a homogenous distribution of power between the output waveguides (Laurent-Lund at Paragraph 81).

2.4 **Regarding Claim 2**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claim upon which Claim 2 depends. Bouda does not specifically disclose a splitter wherein:

a) at least an initial portion of the non adiabatic tapered waveguide proximal to the input waveguide has a taper angle which increases towards the output waveguides.

However, this limitation is taught by Laurent-Lund (Fig.10 and Paragraph 81). Therefore, it would have been obvious to one who was skilled in the art at the time of invention to combine the non-adiabatic tapered waveguide of Bouda with the non-linear waveguide of Laurent-Lund in order to provide a homogenous distribution of power between the output waveguides (Laurent-Lund at Paragraph 81).

2.5 **Regarding Claim 3**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claims upon which Claim 2 depends. Bouda specifically discloses a splitter wherein:

a) the non adiabatic waveguide tapers gradually so as to excite a second order mode therein (Col. 4, Lines 44-50).

2.6 **Regarding Claim 4**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claims upon which Claim 2 depends. Bouda does not specifically disclose a splitter wherein:

a) the length of the non-adiabatic tapered waveguide, in a direction parallel to the direction of propagation of an optical signal therein, is such that the phase difference between the fundamental and second order modes, at an output end of the non-adiabatic tapered waveguide is equal to $M\pi$ where M=1,3,5,...

However, it is well known in the art that by changing the length of the waveguide, a designer may introduce a $\pi$ phase difference at the output between fundamental and higher order modes denoted by M= 0, 1, 2, 3...(For related art see Bae, US-6728438). Therefore, it would have been obvious to one who was skilled in the art at the time of invention to design the length of the waveguide such that a phase difference between the fundamental and second order modes was achieved so as to provide for an homogenous distribution of power at the output (See Laurent-Lund at Paragraph 81).

2.7 **Regarding Claim 5**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claims upon which Claim 2 depends. Both Bouda and Laurent-Lund specifically disclose a splitter wherein:

a) the non adiabatic tapered waveguide tapers substantially symmetrically with respect to the direction of propagation of an optical signal therein (See Bouda Fig. 1 and Laurent-Lund Fig. 10).

2.8 **Regarding Claim 6**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claims upon which Claim 2 depends. Bouda specifically discloses a splitter wherein:

a) the non adiabatic tapered waveguide has opposing tapered sides each having a taper shape (Fig. 1) **(based on a perturbed cosine function).**

The examiner gives no patentable weight to the highlighted limitation "perturbed cosine function" as it is a function and not a product limitation.

2.9 **Regarding Claim 7**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claims upon which Claim 2 depends. Bouda does not specifically disclose a splitter wherein:

a) said output waveguides are substantially single mode.

The examiner gives no patentable weight to the term 'substantially single mode' because applicants own definition of 'substantially single mode' in the disclosure allows for the waveguides to be multi mode as long as no significant signal is effectively carried by the higher order modes. Additionally, single mode output waveguides are well known in the art. (See Ido in US-6236784, where the output waveguides have the same physical width as the single mode input waveguide in Fig. 1 and 2).

2.10 **Regarding Claim 8**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claims upon which Claim 2 depends. Bouda does not specifically disclose a splitter wherein:

a) at least one of the output waveguides has an adiabatically tapered end which is connected to an output end of the non-adiabatic tapered waveguide and which widens in width towards the non-adiabatic tapered waveguide.

However, Bouda specifically discloses prior art star couplers where tapers are provided at each of the output waveguides (Col. 2, lines 27-36). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to provide the invention of Bouda with tapered output waveguides in order to obtain uniformity in the optical coupling at the output ports (Col. 2, Lines 27-36). For related art see McGreer in US-2002/0159703.

2.11 **Claim 9** is rejected under 35 U.S.C. 103(a) as being unpatentable over Bouda in US-6643432 in combination with Laurent-Lund in US-2005/0207705 and in further view of Li in US-5745619.

2.12 **Regarding Claim 9**, the combination of Bouda and Laurent-Lund teaches all of the limitations of the base claims upon which Claim 9 depends. However, the combination of Bouda and Laurent-Lund does not disclose a splitter comprising:

a) wherein there is a gap between an output end of the non adiabatic tapered waveguide and respective ends of the output waveguides optically coupled thereto.

However, Li specifically discloses an embodiment whereby a transverse gap isolates the output waveguides (Fig. 6E, Col. 7, Lines 25-40). Therefore, it would have been obvious to one who was skilled in the art at the time of invention to provide the combination of Bouda and Laurent-Lund with a transverse gap between the tapered waveguide and output waveguides in order allow for the signals to act more predictably given the practical manufacturing tolerances in the current environment (Li at Col. 7, Lines 25-40).

***Conclusion***

3.1 The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

| Patent Number/Identifier | Name | Relevancy |
|---|---|---|
| US-20020159703 | McGreer | Non Linear Tapered waveguides |
| US-6236784 | Ido | Y branching waveguide |
| US-6222966 | Khan | Adiabatic waveguide with chirp control |
| US-6553164 | Ono | Y branch waveguide |
| US-6728438 | Bae | Control of mode conversion |
| US-6633703 | Katayama | Tapered waveguides |

3.2 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Guy G. Anderson whose telephone number is 571.272.8045. The examiner can normally be reached on M-Th 1130-2200.

3.3 If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on 571.272.2415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

3.4 Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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April 11, 2006

KAVEH KIANNI
PRIMARY EXAMINER